NEMATODE PARASITES OF THE BRAZILIAN LAND-TORTOISE, TESTUDO DENTICULATA.

RESULTS OF THE MULFORD BIOLOGICAL EXPLORATION.—HELMINTHOLOGY.

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Among the numerous vertebrates brought to this country by the Mulford Expedition to northern South America were two specimens of the large land tortoise, *Testudo denticulata*. These animals died shortly after their introduction into the National Zoological Park and through the kindness of the United States National Museum authorities, the author was permitted to examine the viscera for parasitic worms. Four species of nematodes were found, three of which appear to be new to science. Two of the species fall into the Strongyloidea, one of them representing a new genus; of the remaining two, one belongs in the Ascaroidea and the other in the Oxyuroidea.

Superfamily STRONGYLOIDEA.

Family STRONGYLIDAE.

SAURICOLA, new genus.

Generic diagosis.—Strongylidae; Strongylinae, adults about 10 mm. long, head about 140μ in diameter. Buccal capsule small, shallow. Capsule surrounded by two leaf-crowns. Cuticle surrounding mouth forming a short mouth collar, limited behind by an annular constriction. Six circumoral papillae. Lateral papillae stout, apparently with terminal organ. Submedian dorsal and ventral papillae more slender, projecting beyond surface of cuticle, sharply angulate before apex in lateral view. Excretory pore behind the esophagus. Cervical groove and papillae absent. Nerve ring at posterior third of esophagus. Esophagus cylindrical, about twice as long as thick. Bursa of male short, dorsal, and lateral portions of membrane not separated, preanal bulla present, enclosing

two slender prebursal papillae. Dorsal ray quadridigitate, externo-dorsal slender, postero-lateral and medio-lateral stout, subequal, externo-lateral more slender, ventrals subequal, stout, separated to base. Spicules long, slender, simple, gubernaculum small, simple. Vulva just before anus, vagina short, ovejector, and sphincter muscles not developed, uteri two and convergent. Eggs oval with thin shells, not embryonated within uterus.

Genotype.—Sauricola sauricola, new species.

As may be seen from the above diagnosis, this genus is rather closely related to the oesophagostomes, or nodular worms, from which it differs in the very short and thick esophagus, the absence of cervical papillae, the position of the excretory pore and the convergent uteri without muscular ovejectors. Apparently, this worm does not produce nodules in the intestine of the host.

SAURICOLA SAURICOLA, new species.

Specific diagnosis.—Sauricola; body cylindrical, tapering slightly at extremities. Cuticle about 30μ thick, with very coarse transverse striae. Mouth short, chitinous framework of buccal capsule 100μ in outside diameter, walls 15μ thick and 22μ high. Outer leaf crown of short and broad elements, inner crown of long slender acutely pointed blades which project beyond the opening of the mouth. Eighteen elements in each crown (fig. 1). Lateral papillae stout, each with an internal process at apical third. Esophagus 300μ long, (fig. 2), 170μ thick, walls in anterior part thickly studded with stout conical teeth, nerve ring 180μ behind the buccal capsule. Excretory pore 570μ back of mouth collar. Intestine composed of two layers, a thin inner chitinized layer 5μ thick and a thick outer muscular layer of varying thickness, averaging 50μ in thickness. Lumen of intestine of large diameter, about 50μ.

Male.—Tips of the inner of the four subdivisions of the dorsal ray reach the edge of the bursal membrane. Ventral rays separate near their origin (fig. 3). Externo-lateral arises near base of the combined medio- and postero-laterals. Separation of medio- and posterio-laterals occurs slightly beyond apical third of length. There is a dorsal process from the main trunk just before the separation of the lateral rays, as in *Oesophagostomum radiatum*. Externo-dorsal arises near base of dorsal trunk, which bifurcates at the middle of its length. Spicules (fig. 4) slender, equal, 2.36 mm. long. Gubernaculum 68μ long.

Female.—Similar to male in size and general conformation. Posterior extremity of worm (fig. 5) mucronate, external opening of alimentary canal opens 115μ in front of the extreme apex of worm, external cuticle extends 140μ into the worm to the true anus. Vulva opening 140μ in advance of the external opening of the intestine.

Vagina 1.5 mm. long, muscular but without muscular ovejector or sphincter. Uteri convergent, soon parallel, extending forward to just in front of the middle of the worm. Ovaries extending between the end of the uteri and the excretory pore. Eggs (in uterus) 128μ×57μ.

Host.—*Testudo denticulata* (*Testudo tabulata*).

Location.—Intestine (large?).

Locality.—Brazil, Pará.

Type.—U. S. N. M. Helm. Coll. No. 25446 in glycerine. Paratypes (part in glycerine, part in 70 per cent alcohol), Cat. No. 25394; also in the British Museum.

Genus DELETROCEPHALUS Dies.

DELETROCEPHALUS VARIABILIS, new species.

Specific characters.—*Deletrocephalus;* length[1] up to at least 8 mm., form cylindrical, tapering sharply at anterior end, cuticle with widely spaced transverse striae, mouth collar distinct, circumoral papillae six, laterals about 20μ long, apical half cylindrical and much smaller in diameter than basal half, submedian about 10μ long, simple. Buccal capsule (fig. 6) surrounded by a chitinous ring; 10μ deep by about 40μ across. Leaf crown single, composed of eighteen slender leaves, each leaf with conspicuous angular bend at about the middle. Esophagus about 370μ long, slightly enlarged posteriorly, lumen with three longitudinal rows of chitinous bosses, extending through the anterior three-fourths of the length. Nerve ring just in front of the middle of the esophagus. Excretory pore at or just behind the esophago-intestinal valve. Cervical papillae conspicuous, about one-fourth length of esophagus behind its posterior extremity. Intestine slender, with a few small caecal dilations towards the posterior end, especially in the female.

Male.—Bursa (fig. 7) feebly trilobed, dorsal ray normally divided into three trunks, each of which may, and usually does, bifurcate. Externo-dorsal rays slender, arising about middle of dorsal trunk. Trunk of lateral rays stout, trifurcating at about middle. Postero-lateral and externo-lateral rays stout, medio-lateral more slender and joined at its base with the externo-lateral, tips of medio-lateral and externo-lateral approach one another. Ventrals similar and parallel, their tips approximate. Prebursal papillae absent. Spicules (fig. 8) slender, similar, 1.54 mm. long, each with a lateral ala which commences just behind the apex and travels in a long spiral about the spicule, completing three-fourths of one complete circuit.

[1] No mature females available for study.

Female.—Anus 86μ before the end of the short conical, conspicuously annulate tail (fig. 9). Vulva 32μ before anus. Vagina strongly muscular, 180μ long. Uteri two, convergent, running parallel and forward nearly to excretory pore.

Host.—Testudo denticulata.

Location.—In intestine.

Locality.—Brazil, Pará.

Types.—U. S. N. M., Helm. Coll. No. 25445 in glycerine. Paratypes, Cat. No. 25393 (part in glycerine, part in 70 per cent alcohol); also in the British Museum.

Superfamily ASCAROIDEA.

Family ASCARIDAE.

Genus ANGUSTICAECUM Baylis.

ANGUSTICAECUM BREVISPICULUM, new species.

Specific characters.—Angusticaecum; length up to 120 mm., greatest diameter 3 mm. Head (figs. 10, 11) 0.5 mm. in diameter, lips twice as broad at base as high, somewhat rounded. Cuticle transversely striate at intervals of 6μ. Intestinal caecum slightly more than half length of and about one-fourth as thick as the esophagus. Esophagus one fifteenth of the total length. Posterior end of worm mucronate. Anus subterminal.

Male.—Spicules (fig. 12) subequal in length (1.4 and 1.3 mm.), one much thinner (28μ) than the other (85μ). Opening of cloaca about 150μ in front of the posterior extremity. Behind the cloaca there are five pairs of papillae and two single papilliform structures, these last probably glandular. Directly in front of the cloaca there is a transverse sinuous line of five papillae and, extending anteriorly from the second and fourth papillae of this row are two files of papillae, sixteen in each.

Female.—Vulva a transverse slit just before the middle. Vagina about 4 mm. long, uteri double and convergent, reaching nearly to posterior extremity of worm, ovaries intricately coiled about the uteri throughout their length. Anus about 1 mm. in front of the tip of the tail. Eggs 114–142 by 71–85μ with thick smooth shell.

Host.—Tesetudo denticulata.

Location.—Intestine.

Locality.—Brazil, Pará.

Types.—U. S. N. M., Helm. Coll. No. 25406 in 70 per cent alcohol. Paratypes, Cat. No. 25407, in 70 per cent alcohol.

Augusticaecum holopterum (Rudolphi) was originally described as a parasite of the green sea turtle, *Chelonia mydas*, and as having

the head and body alate. The present species comes from a land tortoise and is without alae. Whether the nematode found in *Testudo graecca* of Europe is the same as *Ascaris holoptera* Rudolphi is another question but the great difference in the habits of the hosts would lead one to suspect a misidentification.

Superfamily OXYUROIDEA.

Family OXYURIDAE.

Genus LABIDURIS Schneider.

LABIDURIS GULOSA (Rudolphi).

Syn.: *Labiduris zschokkei* Linstow.

Many hundred specimens of a worm which I refer to the above species were collected from the intestine (colon?) of *Testudo denticulata*. An examination of the specimens shows a great range of variation in the length of the spicules, length of the acute tail and position and number of the preanal papillae. In ten male specimens selected at random, the spicules measured from 0.48 mm. to 0.60 mm. The acute portion of the tail may be as short as the distance from the opening of the cloaca to the base of the tail or more than twice that length. In front of the cloaca there may be as many as five papillae in each of the submedian rows with either none, one or two on either side of the rows. There are, however, usually three papillae in each submedian row.

The points of difference between *L. gulosa* (Rudolphi) as described by Schneider and *L. zschokkei* Linstow, as brought out in von Linstow's original description are (1) tail long in *L. gulosa* and short in *L. zschokkei* and (2) one papillae outside of either submedian row in the former, two in the later. As these differences do not appear to hold in a large series, I am placing von Linstow's species in synonymy. Both species were described from *Testudo tabulata*, which equals *Testudo denticulata*.

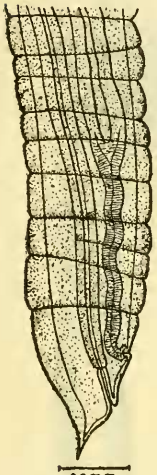
EXPLANATION OF PLATES.

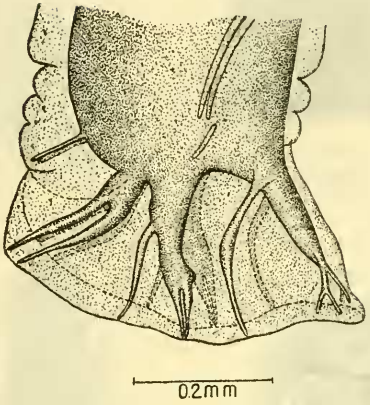
Plate 1.

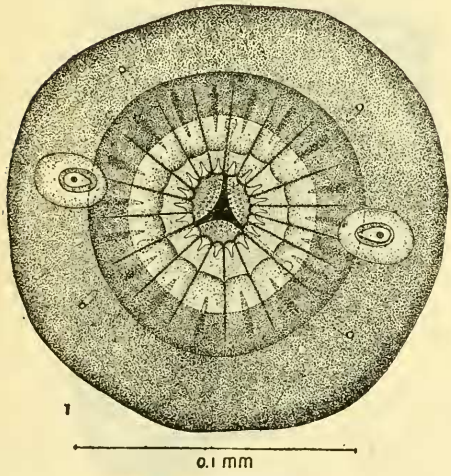
Fig. 1. *Sauricola sauricola*, new species. Front view of head.
2. " " " " Lateral view of anterior end.
3. " " " " Posterior end of male.
4. " " " " Spicules and gubernaculum of male.
5. " " " " Posterior end of female.

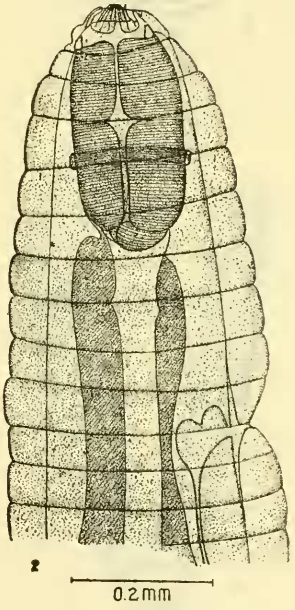
Plate 2.

Fig. 6. *Deletrocephalus variabilis*, new species. Lateral view of anterior end.
7. " " " " Posterior end of male.
8. " " " " Extremities of spicule.
9. " " " " Posterior end of female.
10. *Angusticaecum brevispiculum*, new species. Front view of head, dorsal lip slightly displaced.
11. " " " " Lateral view of head.
12. " " " " Posterior end of male.



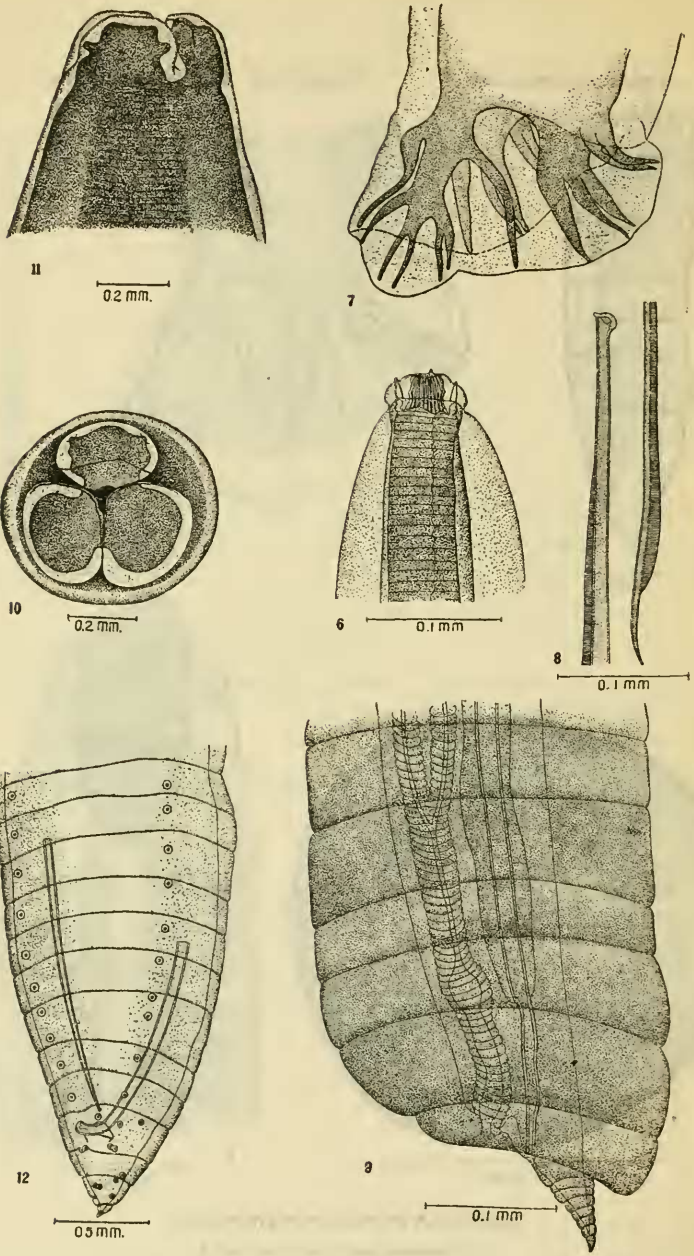






SAURICOLA SAURICOLA, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 6.



DELETROCE PHALUS VARIABILIS, NEW SPECIES, AND ANGUSTICAECUM BREVISPICULUM, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 6.